INCIDENCE AND DISTRIBUTION OF FUSIFORM RUST ON THE OCONEE NATIONAL FOREST, GEORGIA, 1983

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INTRODUCTION

Fusiform rust, caused by the fungus Cronartium quercuum f. sp. fusiforme, is the most serious disease problem facing loblolly and slash pine managers in the Southeast. If the rust hazard for an area is known, fusiform rust control strategies can be integrated into the forest management system. In 1971, state level hazard maps were made for loblolly and slash pine in Georgia (1). The Oconee National Forest had only one hazard zone, according to the 1971 map. The purpose of this survey was to determine the incidence and distribution of fusiform rust on the Oconee National Forest in 1983 and compare it to the rust hazard map constructed in 1971 for Georgia. Since only a small acreage of slash pine is grown on the Oconee, and shortleaf pine is not severely affected, the survey was limited to loblolly.

METHODS

Twenty-four stands were sampled throughout the Forest. All stands were at least one mile apart and were between 4 to 14 years old. Three 100-tree rows, or transects, in natural stands were sampled (2). For each stand, the data collected included; 1) type of stand, and 2) age of stand (by boring three dominant trees or stand records). Each tree was examined and given a condition code of; 1) healthy, not infected by fusiform rust, 2) fusiform canker on the main stem or on a branch within 12 inches of the main stem, 3) dead from fusiform rust, or 4) dead from other.

RESULTS

Fusiform rust was found throughout the Oconee National Forest. The age, percent healthy, galled, killed by rust, dead other, and stand type for each stand sampled are summarized in Table 1. The distribution of the stands throughout the Forest is shown in Figure 1. The lowest amount of infection was 5 percent in a 4 year old stand. The highest amount of infection was 43 percent in a 10 year old stand. An average of 19 percent of the trees in each plot have cankers on or within 12 inches of the main stem.

According to the 1971 survey, the Oconee National Forest had only one hazard zone (Figure 2). Figure 3 shows a map of the hazard found in 1983. A comparison of the two maps shows the hazard to be less than predicted by the 1971 survey. According to this 1983 survey, the Oconee National Forest seems to be of low to moderate hazard.

Table 1.--Summarized data collected on the Oconee National Forest, 1983.

Stand No.	Age	Healthy	Galled	Rust Killed	Dead Other	Type of Stand
		- - - - - - - - percent - - - - - - - -				
1	4	95	5	0	0	Planted
2	12	57	36	4	2	Plantation
3	13	61	36	3	0	Plantation
4	6	86	14	0	0	Planted
5	10	56	39	4	1	Planted
6	3	90	10	0	0	Planted
7	7	81	18	0	1	Seeded
8	6	84	15	1	0	Planted
9	10	69	29	2	0	Planted
10	12	56	40	2	2	Planted
11	4	83	16	0	0	Planted
12	12	70	25	4	1	Planted
13	12	75	24	0	1	Seeded
14	6	88	12	0	1	Planted
15	9	87	12	1	1	Planted
16	7	87	12	0	0	Planted
17	11	71	23	4	2	Seeded
18	14	79	16	2	4	Seeded
19	7	93	6	1	0	Seeded
20	12	87	9	1	2	Planted
21	11	78	19	3	0	Seeded
22	11	81	14	2	3	Seeded
23	10	79	17	2	2	Seeded
24	6	92	7	1	1	Seeded
Average	9	79	19	2	1	

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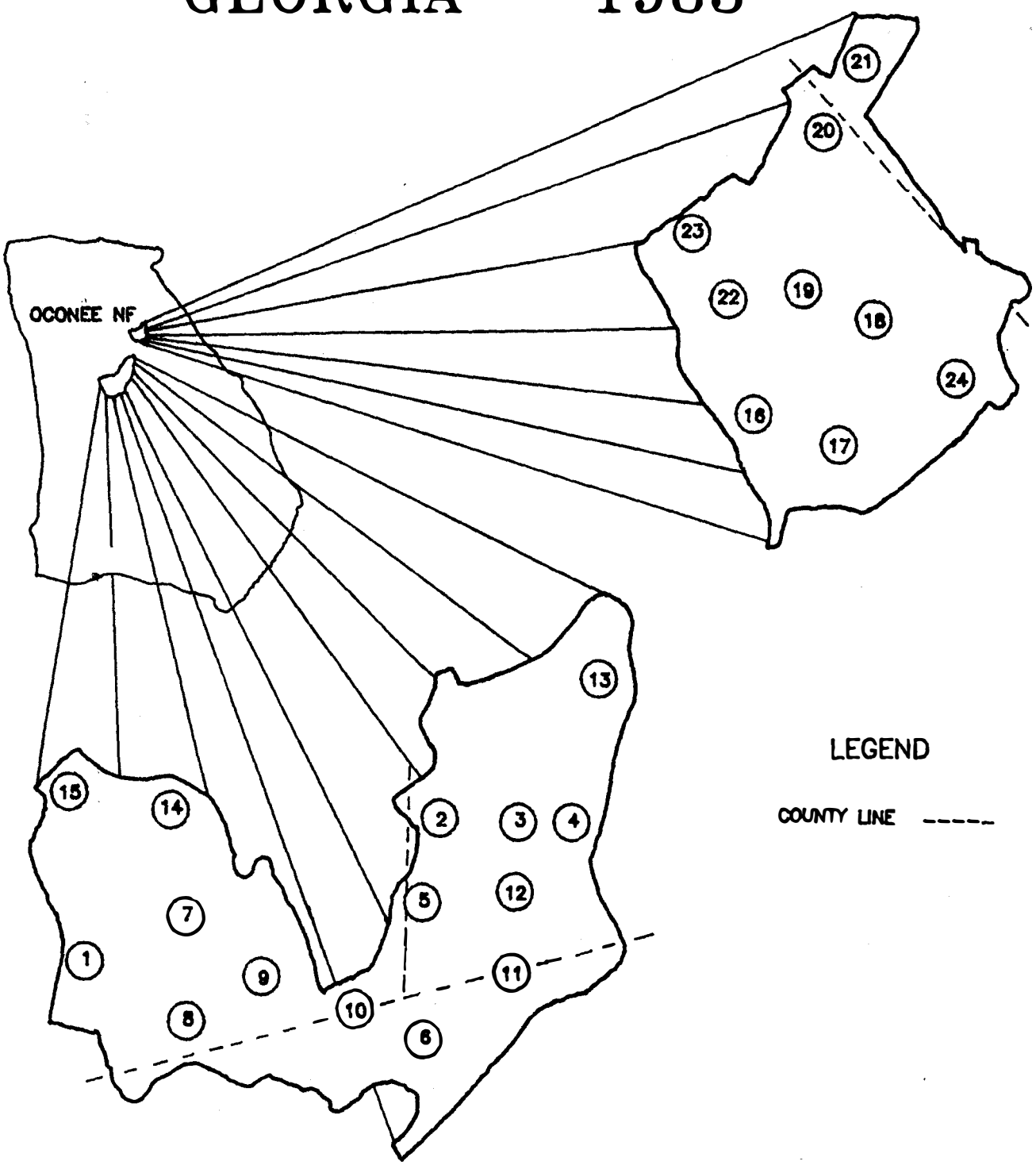


Figure 1.--Distribution of loblolly stands surveyed for fusiform rust on the Oconee National Forest, 1983. The numbered circles correspond to the stand numbers in Table 1.

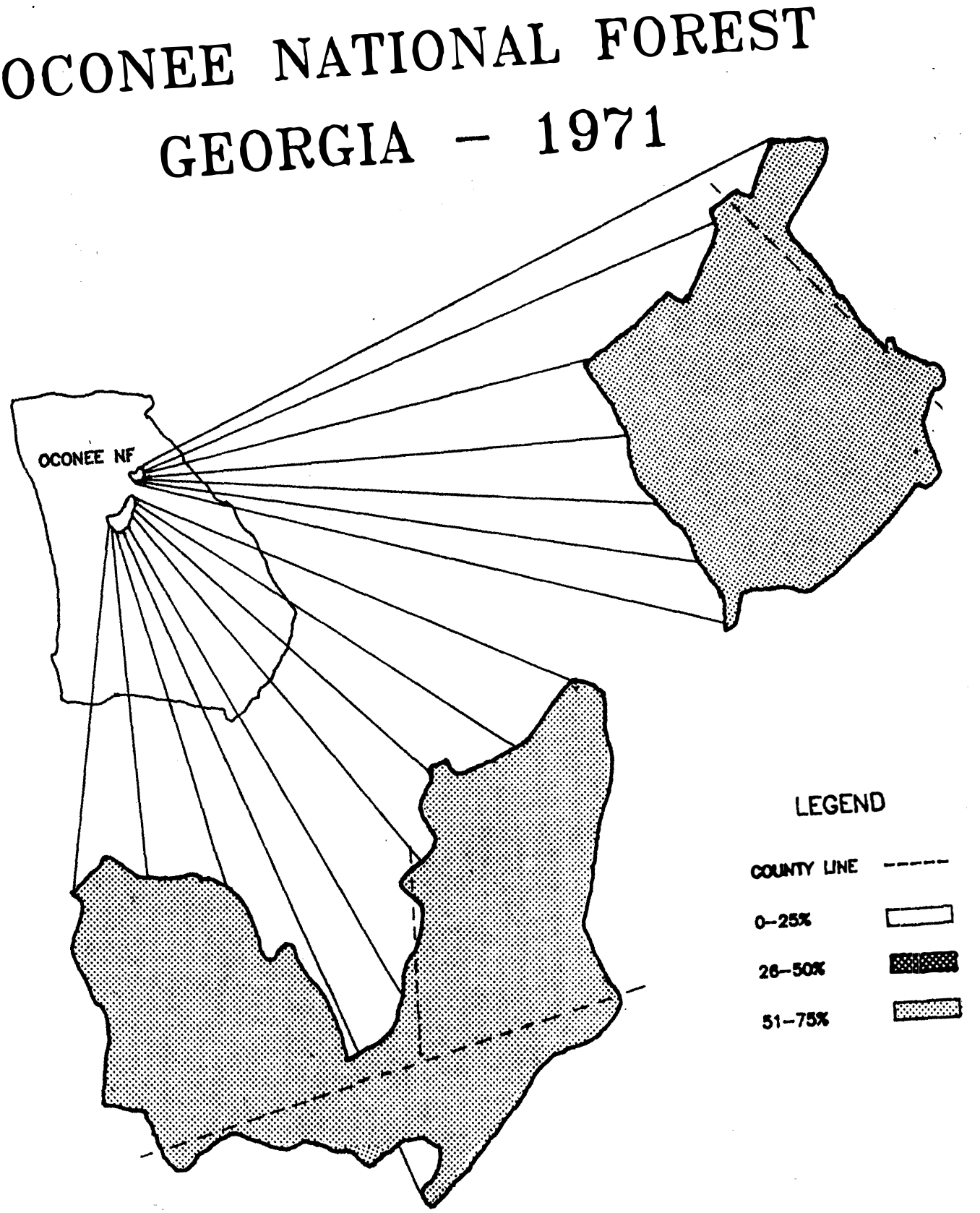


Figure 2.--Fusiform rust hazard zones as established in 1971.

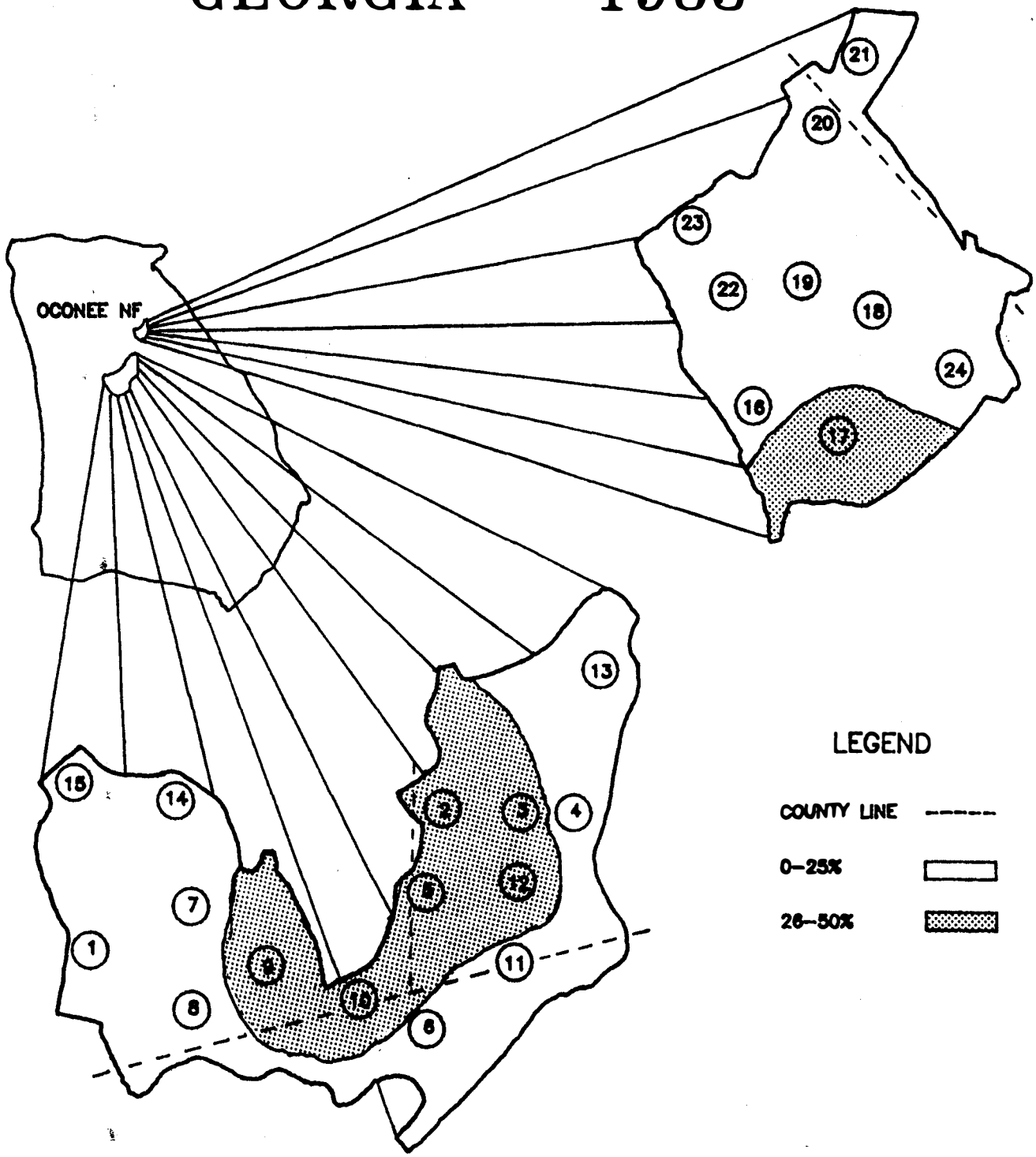


Figure 3.--Fusiform rust hazard zones as established in 1983. The numbered circles correspond to the stand numbers in Table 1.

DISCUSSION

According to the 1983 survey, the percent fusiform should be high enough to affect management in the low hazard area. Most of the stands in the moderate hazard area will not experience serious problems, but this is the area where serious consideration should be given to fusiform in the planning process. The 1971 hazard map did not accurately predict the hazard for the Forest under the present management system. Therefore, the 1983 hazard map should be used in future management strategies. Integrated pest management strategies that deal with the management of fusiform rust hazard areas are included in the Appendix.

LITERATURE CITED

(1) Phelps, W. R. 1973. Fusiform rust incidence survey. USDA For. Serv., Southeast. Area, State and Private For., Atlanta, Ga.

(2) Yandle, D. O. and E. R. Roth. 1971. Survey procedures for fusiform rust. USDA For. Serv., Southeast. Area, State and Private For., Atlanta, Ga.

APPENDIX

Integrated Pest Management (IPM) of the Forest Resources to Reduce Damage Caused by Fusiform Rust

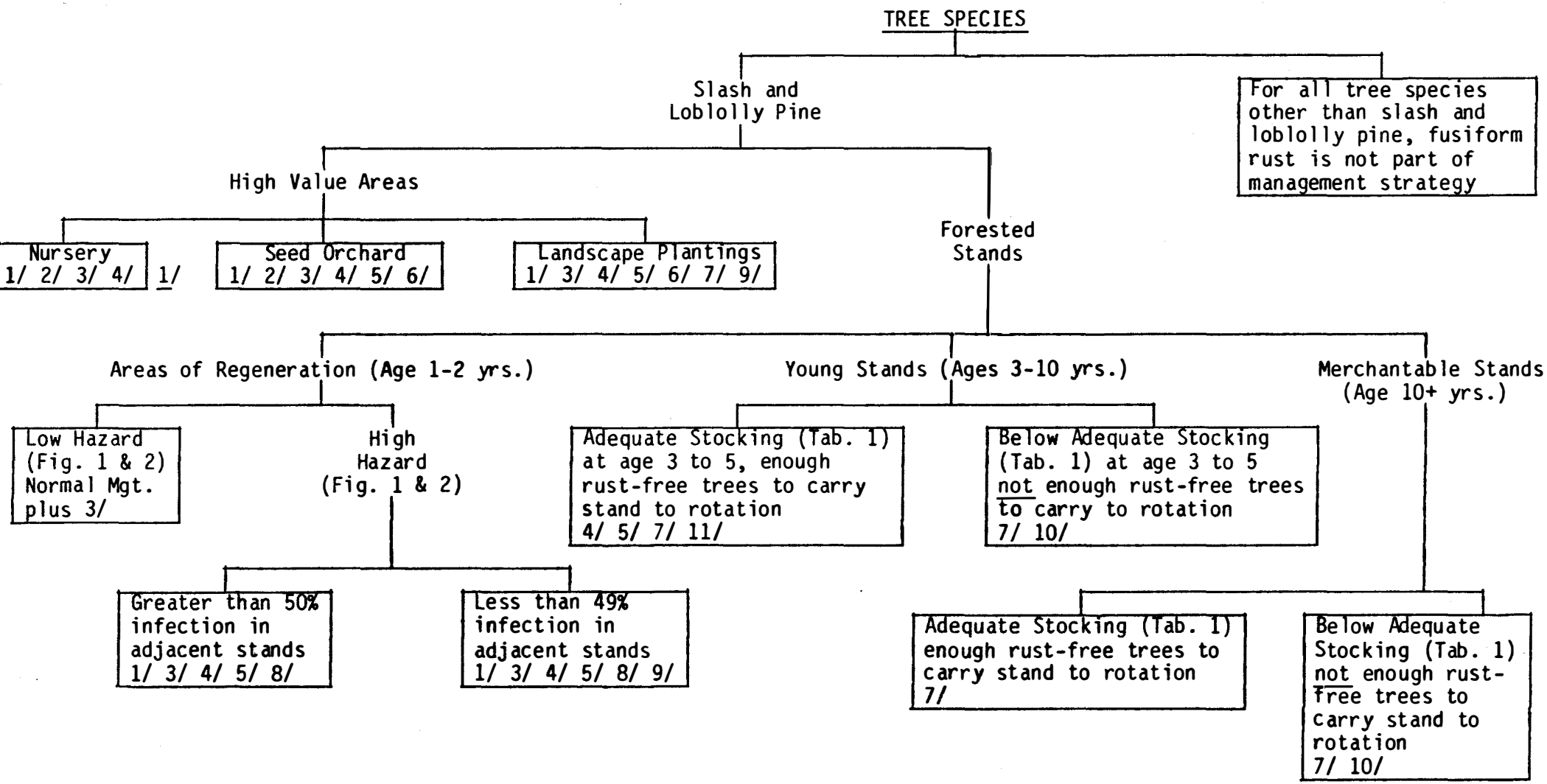
(Hereafter referred to as IPM of fusiform rust damage)

IPM of Fusiform Rust Damage During Planning and Training

Management of the forest resource to reduce fusiform rust includes prevention and suppression. The following integrated pest management strategy for this pathogen should be considered in all forest management plans for geographic areas where fusiform rust is present. Also, this strategy (Figure 1) should be discussed in the pest management training packages periodically given to forest managers.

Integrated Management Strategies

Figure 1.--The following flowchart for IPM of fusiform rust damage applies, and should be considered, wherever the disease is present. Both brief and detailed descriptions of the footnotes follow the flowchart.



/ Each number refers to the numbered management recommendation.

1) Use resistant seeds or seedlings if available.

Avoid planting rust-susceptible pines in high-hazard sites when possible. Regeneration of high-hazard sites should be done with seeds or seedlings from:

- rust resistant seed orchards, or
- resistant species; e.g., longleaf, shortleaf, and sand pine, or
- geographic areas of resistance; e.g., Livingston Parish, La., east Texas.

2) Use protective fungicide sprays.

3) Cull infected seedlings.

Avoid movement of rust-infected stock from the nursery, or cull rust-infected seedlings prior to outplanting.

4) Reduce oak population when practical and when not in conflict with other management practices.

Consider using management techniques which prevent oaks from growing in or adjacent to pine plantings. Indiscriminate eradication of oak trees is not recommended, and careful attention should be given to the value of oaks for wildlife food and habitat, aesthetics, and land values.

5) If fertilization is desirable, and more than 25 percent of the trees are rust-infected, delay fertilization until age 8 to 10.

On moderate- to high-hazard sites, fertilization practices (which predispose pines to infection by promoting more succulent tissue and, therefore, tissue more susceptible to rust infection) should be delayed until trees are 8 to 10 years old. Because of natural pruning in the lower crown, little fusiform rust infection occurs after trees are 10 years old.

6) Prune or excise fusiform galls and cankers in seed orchards and other high-value plantings.

From mid-summer to mid-winter, remove limbs with infections more than 3 inches and less than 18 inches from the bole. Treat stem infections by completely removing the bark from around the canker, leaving a margin of at least 1 inch on the sides and 2 inches above and below the furthest extent of the canker.

7) Favor rust-free trees during tree removal.

a) In adequately stocked stands with low levels of rust infection (less than 25% of trees with stem infections), remove the most severely stem-cankered trees first, followed by removing progressively less damaged trees to obtain a residual basal area of 80 square feet per acre for loblolly and 60 square feet per acre for slash pine.

b) In adequately stocked stands with stem infections on 25 to 50 percent of the trees, thin by removing the high-risk trees (those with 50% or more of the stem circumference cankered).

c) If, for a heavily infected stand, the decision is not to clearcut, but rather to thin, the high-risk trees should be removed. If access is a problem, consider removing every fifth row of trees in the plantation; although, in highly infected areas, removal of the infected trees often alleviates the access problem without the need for row thinning.

8) Consider shelterwood regeneration.

When heavily infected plantations must be eliminated and an adequate number of rust-free trees are available, consider using a shelterwood system to regenerate the next stand.

9) Consider increasing planting density.

Based on fusiform rust infection levels in the area, consider increasing planting density to compensate for the expected loss. This practice can be coupled with timely sanitation thinnings to remove trees with galls.

10) Regenerate, or justify carrying the rotation understocked.

If more than 50 percent of the trees have stem infections, the general rule is to regenerate the stand. Regeneration can be accomplished by clearcutting and planting a resistant seed source (Footnote #1) or considering seed tree regeneration where applicable (Footnote #8). If heavily infected stands are to be retained; e.g., because of wildlife benefits or excessive site preparation costs, consider thinning (Footnote 7c).

11) Consider prescribed burning.

Based on the lower ignition point of fusiform rust galls, as opposed to noninfected pine bark, prescribed burning can reduce fusiform rust infection. Prescribed burning in young stands should be avoided until the trees are 8 years old. In merchantable stands, the prescribed burning should be performed after most stem-cankered trees have been removed in thinnings.

Table 1

Degree of Stocking	Seedling and Sapling Stands (Number of rust-free trees per acre)		Merchantable-sized Stands (Sq. ft. basal area of rust-free trees per acre)	
	Loblolly	Slash	Loblolly	Slash
Adequate	450	300	80	60
Marginal	200-400	150-250	40-50	30-40
Inadequate	150	100	30	20

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